

Inter-Sectorial Risk Pooling and Wage Distributions*

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August 26, 1998

Abstract

This paper develops a model where two agents in different sectors face uncorrelated income risks and mutually self-insure. We discuss how the rent arising from risk pooling modifies the wage distribution in the sector where the employer behaves as a monopsonist.

Keywords: risk pooling, family transfers.

JEL classification: O130, O150, O170.

*We have benefited from discussions with Sylvain Dessy, Bernard Fortin and Simon Van Norden. We are responsible for any remaining errors and omissions.

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1 Introduction

Inter-sectorial transfers by members of extended families are an important component of household incomes in most developing countries (World Bank, 1994). These transfers arise in part because of incomplete insurance markets; agents who cannot hedge against crop failure, health problems or unemployment risks use non-market mechanisms as a substitute (Ligon et al., 1997). Typically extended families have a comparative advantage in providing such services because of superior information that mitigate moral hazard and adverse selection problems (Pollak, 1985). Moreover, most of the labour force in those economies is employed in agriculture (Larson and Mundlak, 1997, Table 2). Land, an essential input in that sector, is controlled by a small number of landlords (Tomich et al., 1995) who often use a collusive strategy when hiring workers (Bardhan, 1989).

This note focuses on the link between inter-sectorial transfers between agents with symmetric information, and wage distributions in labour markets characterized by intra-sectorial collusion among employers. We first illustrate how such transfers modify the distribution of wages paid by an employer who behaves as a monopsonist. Secondly, we indicate why transfers can imply a transmission mechanism for wage distributions across sectors. Finally, we show why, in the absence of inter-sectorial collusion, the economy may be stuck in a poverty trap.

2 Model

Consider an economy with two sectors denoted $i = 1, 2$, each with many identical agents (workers) and a small number of employers. Agents do not have access to a storage technology, while they derive utility from consumption exclusively, and are expected-utility maximizers with monotone and concave Von Neumann-Morgenstern utility function $u(\cdot)$.

Let $w_i \in \{\bar{w}_i, \underline{w}_i\}$, where $\bar{w}_i > \underline{w}_i$, denote the stochastic income of a representative agent employed in sector i , with $p_i \equiv \Pr(w_i = \bar{w}_i)$. Inter-sectorial incomes are independent while intra-sectorial incomes are perfectly correlated. We abstract from migration across sectors. The realization of the agents' income is common knowledge to agents, but not to employers. This structure precludes any form of intra-sectorial risk pooling, including self-insurance and market insurance. Consequently, two risk-averse agents may agree to pool risk across sectors and transfer part of their income

to each other (Kocherlakota, 1996). Let $t_i > 0$ denote the transfer from a representative agent in sector i (henceforth agent i) to an agent in the other sector. This transfer is determined after some bilateral bargaining process – which is taken as given in this analysis – and takes place when only one of the two agents receives the low income. In this case, the high-income earner transfers part of his revenues to the low-income one.¹

Agreement to the transfer scheme by agent 1 implies that his expected utility is greater under risk pooling than under autarky, i.e.:

$$r_1 \equiv p_1 p_2 u(\bar{w}_1) + p_1(1 - p_2)u(\bar{w}_1 - t_1) + (1 - p_1)p_2 u(\underline{w}_1 + t_2) + (1 - p_1)(1 - p_2)u(\underline{w}_1) - [p_1 u(\bar{w}_1) + (1 - p_1)u(\underline{w}_1)] \geq 0. \quad (1)$$

where r_1 is agent 1's surplus. After some simplification, inequality (1) can be rewritten as:

$$p_2 \geq \frac{p_1 [u(\bar{w}_1) - u(\bar{w}_1 - t_1)]}{p_1 [u(\bar{w}_1) - u(\bar{w}_1 - t_1)] + (1 - p_1) [u(\underline{w}_1 + t_2) - u(\underline{w}_1)]} \equiv p_2^*, \quad (2)$$

where p_2^* is the lowest probability that agent 2 receives \bar{w}_2 such that agent 1 accepts the risk-pooling agreement. Using the equivalent of inequality (2) for agent 2, we obtain:

$$p_1 \geq \frac{p_2 [u(\bar{w}_2) - u(\bar{w}_2 - t_2)]}{p_2 [u(\bar{w}_2) - u(\bar{w}_2 - t_2)] + (1 - p_2) [u(\underline{w}_2 + t_1) - u(\underline{w}_2)]} \equiv p_1^*. \quad (3)$$

It can be shown that a necessary condition for transfers to take place between agents is that the marginal benefit from the transfer received must be at least as large as the marginal loss from the transfer paid:

$$u(\underline{w}_i + t_j) - u(\underline{w}_i) \geq u(\bar{w}_i) - u(\bar{w}_i - t_i), \quad (4)$$

¹One example of such a transfer scheme is when $\bar{w}_1 = \bar{w}_2 = \bar{w}$ and $\underline{w}_1 = \underline{w}_2 = \underline{w}$ and both agents have the same bargaining power. Equalizing marginal rates of substitution yields transfers given by the unconditional mean income, i.e. $\bar{w} - t_i = \underline{w} + t_i$ which simplifies to $t_i = 1/2(\bar{w} + \underline{w})$. Other elements that determine the transfers t_i might include non-insurance motives such as altruism, over which preferences are not defined in our model.

for $i, j = 1, 2$ and $i \neq j$. Under condition (4), the inequalities (2) and (3) define a convex contract set in the probability space, as illustrated in the left panel of Figure 1. The transfer scheme occurs only if (p_1, p_2) lie in the shaded region.²

Demand for labour in sector 1 is characterized by imperfect competition with collusion among employers. As in Bencivenga and Smith (1997), a representative principal uses a mixed strategy and announces an employment contract which consists of the probability p_1 that agent 1 will obtain \bar{w}_1 , taking p_2 and all wages as given.³ For now, sector 2 is treated as exogenous in this analysis. The principal chooses p_1 to maximize agent 1's risk-pooling surplus r_1 . He does so because, behaving as a monopsonist, he will eventually be able to extract this rent from agent 1 through some mechanism left implicit in our analysis. Monotonicity of $u(\cdot)$ in equation (1) implies that r_1 is decreasing in p_1 :

$$\frac{\partial r_1}{\partial p_1} = (p_2 - 1)[u(\bar{w}_1) - u(\bar{w}_1 - t_1)] - p_2[u(\underline{w}_1 + t_2) - u(\underline{w}_1)] < 0.$$

Consequently, the principal chooses the lowest p_1 which satisfies the participation constraint for agent 2 given by inequality (3), and sets $p_1 = p_1^*$ (see the left panel of Figure 1).

Following an exogenous increase in p_2 , the relative risk of agent 2 of receiving \underline{w}_2 decreases compared to the risk faced by agent 1 of obtaining the low wage. Hence, a risk-pooling contract becomes less attractive to agent 2. The principal who wishes to maintain the risk-sharing arrangement between the two agents must also raise the probability of the high outcome for agent 1. Therefore, risk-sharing between agents in different sectors allows for an *alternative* inter-sectorial transmission mechanism for wage distributions.

Moreover, under perfect intra-sectorial collusion but in the absence of inter-sectorial collusion, extracting the rent created by risk pooling may lead to a poverty trap. In the right panel of Figure 1, if the principal in sector 2 is also a monopsonistic Stackleberg player, its strategies are symmetric to those of sector 1: this employer sets $p_2 = p_2^*$, taking p_1^* as given. Subsequently, the principal in sector 1 responds by choosing a lower p_1 . The unique stable equilibrium is $p_1 = p_2 = 0$, with agents exclusively receiving the low wages $(\underline{w}_1, \underline{w}_2)$.

²When inter-sectorial transfers are symmetric, i.e. $t_1 = t_2$, risk aversion guarantees that condition (4) is verified.

³For example, in the case of agricultural economies, if $(1 - p_i)$ is the probability of a bad crop, the principal in sector i can affect the risk of crop failure by investing in fertilizers, machinery, etc. Another interpretation is that \bar{w}_i and \underline{w}_i are fixed institutional wages for employment in high- and low-productivity activities, and that p_i and $(1 - p_i)$ are the corresponding employment rates chosen by the principal.

3 Conclusion

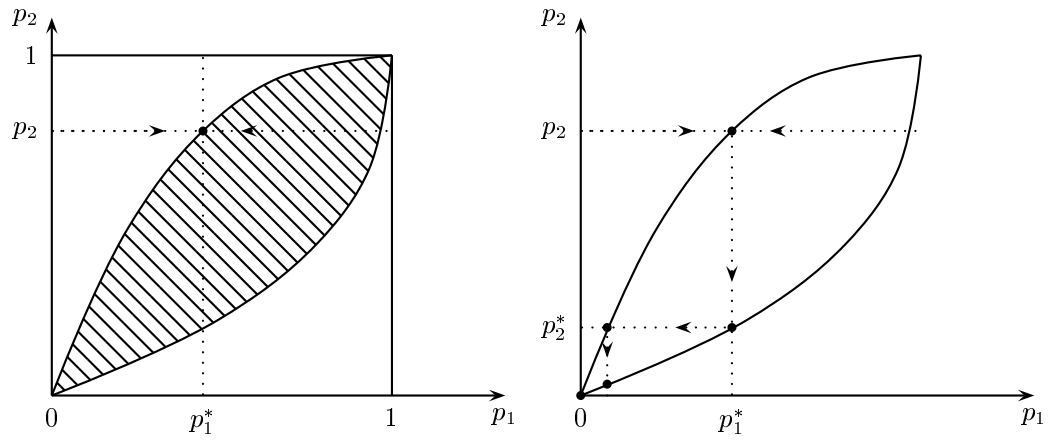
This paper has developed a two-sector model to show how inter-agents transfers can affect the distribution of wages. When the realization of states is observed only by risk-averse agents with uncorrelated income risk, mutual risk-pooling agreements can arise. The rent thus created can be extracted by a monopsonist employer who chooses the wage distribution to maximize the surplus of his employees which he subsequently extracts. One important implication is a transfers-based inter-sectorial transmission mechanism. This linkage between wage distributions across sectors can have perverse effects if both sectors are monopsonistic and do not collude: all employment tends to be concentrated in low-wages allocations.

Finally, an application of our analysis could be rural and urban sectors where it is in the best interest of a unique rural employer to keep up with the pace of development in the urban sector by increasing rural employment in high wage activities.

References

- Bardhan, Pranab (1989) *The Economic Theory of Agrarian Institutions* (New York: Oxford University Press)
- Bencivenga, Valerie R., and Bruce D. Smith (1997) 'Unemployment, migration and growth.' *Journal of Political Economy* 105, 582–608
- Kocherlakota, Narayana R. (1996) 'Implications of efficient risk sharing without commitment.' *Review of Economic Studies* 63, 959–609
- Larson, Donald, and Yair Mundlak (1997) 'On the intersectoral migration of agricultural labor.' *Economic Development and Cultural Change* 45(2), 295–319
- Ligon, Ethan, Jonathan P. Thomas, and Tim Worrall (1997) 'Informal insurance arrangements in village economies.' mimeo, Agricultural and Resource Economics, University of California at Berkeley
- Pollak, Robert (1985) 'A transaction approach to families and households.' *Journal of Economic Literature* 23, 581–608
- Tomich, Thomas P., Peter Kilby, and Bruce F. Johnston (1995) *Transforming Agrarian Economies: Opportunities Seized, Opportunities Missed* (Ithaca: Cornell University Press)
- World Bank (1994) *Averting the Old Age Crisis: Policies to Protect the Old and Promote Growth* (New-York: Oxford University Press)

Figure 1:



$$p_i \equiv \Pr(w_i = \bar{w}_i), \quad i = 1, 2$$

Convex contract set: shaded area is joint distribution
where risk-pooling contracts take place.

Poverty trap